

REMARKS**DETAILED ACTION**
Detailed Action Item 1
Claim Objections

The Examiner writes:

1. Claims 1, 18 & 20 are objected to because of the following informalities:

In the claim 1:

line 13: the limitation "over the matrix of imaging sensors" is unclear. This should be deleted.

line 15: the limitation "said patterned color filter" should be "said first patterned color filter".

line 18: the limitation "the first color filter" should be "the first patterned color filter".

Line 19: the limitation "with" should be deleted.

In the through claim 1, the limitation "and/or" is unclear. The "or" should be deleted.

In claim 18, line 3: the limitation "the first first passivation layer" should be "the first passivation layer".

In claim 20, line 3: the limitation "said patterned color filter" should be "the second patterned color filter".

Appropriate correction is required.

The Applicants have made appropriate corrections to these claims.

Detailed Action Items 2 & 3**Claim Rejections - 35 USC Section 103**

3. Reconsideration of the rejection of Claims 1-3, 5-6, 8-9, 11, 13 & 18-19 under 35 U.S.C. 103(a) as being unpatentable over Otsuka (US 6,040,591) in view of Baek (US 6,127,668) and further in view of Jie et al. (US 6,133,954) is respectfully requested based on the following:

The Examiner writes:

Re claims 1, 20 & 21, Otsuka teaches a method of fabricating a semiconductor color imager having a optical structure, comprising (Fig.5):

a semiconductor substrate (11) having a matrix of imaging sensors (2) formed thereon, each image sensor having a photosensitive area and a complementary non-photosensitive area, said matrix of imaging sensors being organized in a plurality of subsets;

forming a first matrix of light shields (13) over the non-photosensitive areas of the matrix of imaging sensors;

forming a first planarizing layer (14) over the matrix of imaging sensors;

forming a first patterned color filter layer (15) on the first planarizing layer, said

patterned color filter layer being registered with the photosensitive areas of a first subset of the matrix of imaging sensors;

forming a second planarizing layer (16) on the first patterned color filter layer;

patterning a layer of microlens material (17) to form a first matrix of microlenses

over the second planarizing layer, said first matrix of microlenses being registered with the photosensitive areas in the matrix of imaging sensors; and

forming an overcoat layer (18) over the first matrix of microlenses, said overcoat layer having high transmittance, said overcoat layer providing patterned or uniform optical compensation between the subsets of the matrix of the imaging sensors;

whereby the performance of the color imager is optimized. See also Col.3, line 56 - Col. 4, line 15.

Otsuka does not teach depositing a passivating coating encapsulating a metal photoshield layer. However, Baek teaches depositing a passivating coating (43) encapsulating a metal photoshield layer (42). See Fig.3c & Col.3, line 61 - Col.4, line 7.

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Baek into the Otsuka's device in order to protect the metal photoshield layer.

Neither Otsuka nor Baek teaches forming a second patterned color filter and third polarization/patterned color filter layers.

The Applicants agree with the Examiner that Otsuka and Baek do not teach second and third patterned and planarized color filter layers. It is assumed that the Examiner meant "planarized" and not "polarized" in the above last sentence.

Th Examiner writes:

Jie et al. in Fig.4H teach the second filter 49" and the third polarization/patterned

color filter layers (46' & 50"). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Jie et al. into Otsuka's device as modified by Baek since a plurality of color filters, which are associated with the photodiodes provide color sensitivity.' "

The Applicants respond:

The Examiner in Action Item 1 recommended removing from claim 1 the wording "and/or" and replacing it with "and". Doing so would put the claim into a reading as similar to the above.

But that is not what the Applicants had disclosed; that of an alternative situation. The particular instant second or third planarized layers are either a spacer layer or a color filter layer and not both as shown in Fig. 4H of Jie et al. The method of forming either the spacer or the color filter is not necessarily the same as shown in Jie et al.

The Applicants have amended claim 1 (as well as that for claims 7, 10 and 12) to show an important part of the invention, that of maintaining an optical structure to facilitate manufacturing as it relates to tolerance build up and component design consideration in producing a family of devices whose color responses are different. By using a spacer in lieu of a color filter the structure dimensions are maintained so as to preclude compensating designs in the microlens. The major point of the invention is directed to the overcoating of the micro lenses.

Furthermore, Jie et al teaches via Fig. 4H that the first and second color filter layers are not planarized as in the instant case.

Moreover, none of the references provide for a patterning of the overcoat layer.

Re claim 2, Otsuka teaches the semiconductor substrate material is made of silicon.

Re claim 3, Otsuka teaches the matrix of imaging sensors comprise CCD.

Re claim 5, Otsuka teaches the overcoat layer is comprised of a negative type photoresist having refractive index adjusted to match the refractive index of the microlens material.

Re claim 6, Otsuka teaches the overcoat layer is comprised of a patterned multi player stack (18 & 19) such that one or more color filters are thereby integrated with the overcoat material.

Re claim 8, Otsuka teaches the elements of the first matrix of microlenses is comprised of hemispherical convex.

Re claim 9, Otsuka teaches the microlens layer material is selected from the group of positive or negative conventional photolithographic materials.

Re claim 11, Otsuka teaches the overcoat layer is comprised of a negative type photoresist to serve as a thermal barrier and protective encapsulant for a microlens layer material comprising a positive type photoresist.

Re claim 13, Otsuka teaches the microlens focal length and depth of focal is adjusted by controlling the thickness and refractive index in the final fabrication step of the color imager.

Re claims 18-19, Otsuka as modified by Baek does not teach a second & third matrix of light shields. Sano et al. teach the second (56) & third (58) matrix of light shields to prevent uneven sensitivity and blurred images. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teach of Sano into the Otsuka's device since three light shielding layers along the optical paths transmitting through the lens, even not entering the photodiode and scattered in the interior does not result in the flare light invading the adjacent photodiode, whereby uneven sensitivity and blurred images never occur.

The Applicants reply that the above claims are dependent directly or indirectly on claim 1.

Detail Action Item 4 Allowable Subject Matter

The Examiner writes:

4. Claims 7, 10, & 12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Prior art reference, taken alone or in combination, do not teach or render obvious

that a layer of microlens material is patterned to form a second matrix of microlenses over the first matrix of microlenses having a high transmittance undercoat, said second matrix of microlenses being registered with the first matrix of microlenses whereby a compound microlens structure and undercoat/overcoat layers are formed to satisfy optical specification and performance.

Prior art reference, taken along or in combination, do not teach or render obvious that the overcoat layer is exposed to calibrated dosages of ultraviolet or other irradiation to photopolymerize the high transmittance overcoat material whereby the index of refraction, polarizing properties, spectral absorption characteristics are tailored and the overcoat material molecules are cross-linked to provide thickness control.

The Applicants reply:

Claims 7, 10 and 12 have been rewritten as independent claims incorporating all the limitations of claim 1.

CONCLUSION

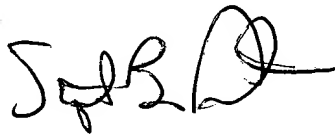
We have reviewed the related art references made of record and agree with the Examiner that none of these suggest the present claimed invention.

In light of the above arguments, it is suggested that the Claims now clearly distinguish the invention from the prior art. All claims are therefore believed to be in condition for allowance.

Allowance of all claims is therefore respectfully requested.

It is requested that should Examiner Kang not find that the Claims are now Allowable that the Examiner call the undersigned attorney at 845-452-5863 to overcome any problems preventing allowance.

Respectfully submitted,



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